

1 **LOCKING DEVICE FOR A TELESCOPIC TUBE ASSEMBLY**

2 **BACKGROUND OF THE INVENTION**

3 1. Field of the Invention

4 The present invention relates to a locking device, and more particularly
5 to locking device for securing an inner tube in an outer tube of a telescopic tube
6 assembly.

7 2. Description of Related Art

8 With reference to Fig. 6, a conventional locking device (30) for a
9 telescopic tube assembly having an outer tube (40) and an inner tube (41)
10 slidably received in the outer tube (40) includes a knob (31) rotatably mounted
11 on a side of the locking device (30).

12 When the relative position of the inner tube (41) is to be readjusted in
13 relation to the outer tube (40), the operator has to hold the inner tube (41) to
14 prevent the inner tube (41) from slipping too far into the outer tube (40). Then
15 the operator is able to unscrew the knob (51) and change the relative position of
16 the inner tube (41) to the outer tube (40). However, when a distal end of the inner
17 tube (41) is provided with a heavy load, e.g., an illuminating device, it is
18 impossible for the operator to hold the weight of the illuminating device.
19 Therefore, assistance from the others becomes essential. That is, it is almost
20 impossible for a lone operator to finish the adjustment of the telescopic tube
21 assembly especially when a weighty object is mounted on the top of the
22 telescopic tube assembly.

23 With reference to Fig. 7, a second conventional locking device for a
24 telescopic tube assembly having an outer tube (50) and an inner tube (51)

1 slidably received in the outer tube (50) includes a sleeve (60) screwingly
2 connected to the outer tube (50), a stopping sleeve (61) formed on a distal end of
3 the inner tube (51) and a C clip (62) provided between the outer tube (50) and the
4 inner tube (51).

5 When this conventional locking device is in application, the stopping
6 sleeve (61) engages with an inner face of the outer tube (50) to stop relative
7 movement between the inner tube and the outer tube (50,51). Furthermore, the
8 deformation of the C clip (62) by the rotation of the sleeve (60) enhances the
9 immovability of the inner tube (51) relative to the outer tube (50). Therefore,
10 unscrewing the sleeve (60) enables the operator to adjust the relative position of
11 the inner tube (51) to the outer tube (50).

12 With reference to Fig. 8, another conventional locking device for a
13 telescopic tube assembly having an outer tube (70) and an inner tube (71)
14 slidably received in the outer tube (70) includes an engaging sleeve (72) for
15 preventing the inner tube (71) separating from the outer tube (70), multiple
16 resilient straps (73) mounted on the outer periphery of the inner tube (71) to
17 engage with the inner periphery of the outer tube (70), a spring (74) mounted on
18 the bottom of the inner tube (71) and a muffler (75) received in the outer tube (70)
19 to diminish the noise from the engagement between the resilient straps (73) and
20 the inner periphery of the outer tube (70).

21 Despite the different structure of the three conventional locking devices,
22 there is a common drawback that hinders the performance of the locking devices.
23 That is, the friction force to prevent the inner tube from falling into the outer tube
24 becomes weaker and weaker each time the relative position between the inner

1 tube and the outer tube is adjusted.

2 To overcome the shortcomings, the present invention tends to provide an
3 improved locking device to mitigate the aforementioned problems.

4 SUMMARY OF THE INVENTION

5 The primary objective of the present invention is to provide an improved
6 locking device to enable the operator to safely finish the adjustment of the
7 relative position of the inner tube relative to the outer tube with ease.

8 Another objective of the present invention is that the locking device of
9 the present invention is able to increase the friction with the inner periphery of
10 the outer tube so as to support the inner tube inside the outer tube.

11 Other objects, advantages and novel features of the invention will
12 become more apparent from the following detailed description when taken in
13 conjunction with the accompanying drawings.

14 BRIEF DESCRIPTION OF THE DRAWINGS

15 Fig. 1 is an exploded perspective view of the locking device applied on a
16 stand;

17 Fig. 2 is schematic perspective view showing that the telescopic tube
18 assembly is used to support a microphone and is supported by the stand.

19 Figs. 3, 4 and 5 are partial cross sectional views showing the application
20 of the locking device of the present invention inside the inner tube and the outer
21 tube;

22 Fig. 6 is a side view showing a conventional locking device used to
23 secure the inner tube inside the outer tube;

24 Fig. 7 is a partial cross sectional view of another conventional locking

1 device in the telescopic tube assembly; and

2 Fig. 8 is a partial cross sectional view showing a further conventional
3 locking device to secure the relative position of the inner tube to the outer tube.

4 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

5 With reference to Figs. 1 and 2, a telescopic tube assembly includes an
6 outer tube (20) and an inner tube (21) slidably received in the outer tube (20).
7 The outer tube (20) has inner threading (200) formed on an inner periphery of the
8 outer tube (20) and a guiding groove (201) defined in opposite sides of the inner
9 periphery of the outer tube (20). The inner tube (21) has a threaded rod (211)
10 formed on and extending out of a distal end of the inner tube (21).

11 A locking device in accordance with the present invention includes a
12 guiding ring (22), a securing ring (23), a friction element (24), a spring (25), a
13 wedge (26) and a bolt (27). A top cap (29) and a bottom cap (28) are provided to
14 respective openings of the outer tube (20).

15 The guiding ring (22) has a first through hole (220) defined through the
16 guiding ring (22) and a guide (221) formed on opposite outer peripheries of the
17 guiding ring (22) to correspond to the guiding grooves (201). The securing ring
18 (23) is provided with a threaded hole (231) defined to correspond to the bolt (27).
19 The friction element (24) has a first through hole (241) to correspond to the bolt
20 (27) and multiple legs (242) deformably formed on and extending out of the
21 friction element (24). The wedge (26) has a second through hole (261) defined to
22 correspond to the bolt (27).

23 The top cap and the bottom cap (29,28) both have a through hole,
24 namely, the third through hole (291) and fourth through hole (281), and an outer

1 threading (292,282) formed to correspond to the inner threading (200) of the
2 outer tube (20).

3 A stand (10) with multiple extensions (100) extending out from a body
4 (11) has a knob (101) rotatably mounted on a side of the body (11) and an
5 insertion hole (102) defined to correspond to a distal end of the outer tube (20).

6 With reference to Figs. 3, 4 and 5, when the locking device of the present
7 invention is assembled, it is noted that the guiding ring (22) is securely mounted
8 on an upper portion of the inner tube (21) and the securing ring (23) is securely
9 received in the inner tube (21) such that the securing ring (23) is immovable
10 relative to the inner tube (21). Thereafter, the bolt (27) is extended through the
11 second through hole (261) of the wedge (26), the spring (25), the first through
12 hole (241) of the friction element (24) and the threaded hole (231) of the securing
13 ring (23). Then the assembly is received in the outer tube (20), and the top cap
14 (29) and the bottom cap (28) are respectively applied to the opening (not
15 numbered) of the outer tube (20) to prevent the inner tube from slipping out of
16 the outer tube (20). It is noted that to secure the engagement between the top cap
17 (29) and the outer tube (20) and the engagement between the bottom cap (28) and
18 the outer tube (20), both the top and bottom caps (29,28) are provided with the
19 outer threading (292,282) formed on outer peripheries of the top and bottom caps
20 (29,28) to correspond to and screwingly engage with the inner threading (200) of
21 the outer tube (20). After the extension of the bolt (27) through the wedge (26),
22 the spring (25), the friction element (24) and into the securing ring (23), it is
23 noted that the friction element (24) has an upper portion securely fitted into the
24 inner tube (21) and a shoulder (243) formed on an outer periphery of a mediate

1 portion of the friction element (24) to abut a peripheral edge of the inner tube
2 (21). Therefore, when the operator is using a tool (not shown), preferably a
3 screwdriver, to rotate the bolt (27) from the fourth through hole (281) of the
4 bottom cap (28), due to the bolt (27) being screwingly engaged with the threaded
5 hole (231) of the securing ring (23), movement of the bolt (27) toward the
6 securing ring (23) forces the wedge (26) to move toward the friction element
7 (24). As a result, the legs (242) are forced to extend toward the inner periphery of
8 the outer tube (20). With further movement of the wedge (26) towards the
9 friction element (24), the friction between the legs (242) and the outer tube (20)
10 becomes larger. Therefore, the inner tube (21) becomes immovable relative to
11 the outer tube (20).

12 In order to readjust relative position of the inner tube (21) to the outer
13 tube (20), the operator gradually unscrews the bolt (27) to lessen the friction with
14 the inner periphery of the outer tube (20) such that the inner tube (21) is movable
15 relative to the outer tube (20). After the inner tube (21) is moved to a proper
16 position, the operator screws the bolt (27) to force the legs (242) to extend and
17 thus the friction between the legs (242) and the inner periphery of the outer tube
18 (20) is able to support the weight of the inner tube (21). When readjustment of
19 the inner tube (21) to the outer tube (20) is required, the bolt (27) is moved
20 backward, which lessens the driving force to the wedge (26). Therefore, the
21 force from the spring (25) expedite the movement of the wedge (26) away from
22 the friction element (24) and therefore the friction between the legs (242) and the
23 inner periphery of the outer tube (20) is reduced.

24 Referring to Fig. 2, it is noted that when there is a load on top of the inner

1 tube (21), the friction between the legs (242) and the inner periphery of the outer
2 tube (20) is able to support the total weight of the inner tube (21) and the weight
3 of an additional device, such as a microphone assembly (11).

4 Furthermore, while the inner tube (21) is moving inside the outer tube
5 (20), the guide (221) is also moved along the guiding grooves (200) inside the
6 outer tube (20) to smoothen the movement of the inner tube (21) to the outer tube
7 (20).

8 It is to be understood, however, that even though numerous
9 characteristics and advantages of the present invention have been set forth in the
10 foregoing description, together with details of the structure and function of the
11 invention, the disclosure is illustrative only, and changes may be made in detail,
12 especially in matters of shape, size, and arrangement of parts within the
13 principles of the invention to the full extent indicated by the broad general
14 meaning of the terms in which the appended claims are expressed.